

THE PENDING CLAIMS:

1. (Previously Presented) A method for removing a residue from a substrate surface, comprising:

mixing an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight, with a hydrogen peroxide solution to produce an intermediate solution at a predetermined temperature of about 3°C or less higher than temperatures of the aqueous solution and the hydrogen peroxide solution,

diluting the intermediate solution with water to form a cleaning solution, wherein the cleaning solution comprises:

hydrogen peroxide at a concentration within a range from about 1% to about 15% by weight;

sulfuric acid at a concentration within a range from about 1% to about 10% by weight; and

hydrogen fluoride at a concentration within a range from about 10 ppm to about 1,000 ppm;

applying an aliquot of the cleaning solution to a substrate surface for a time period; and

rinsing the aliquot from the substrate surface with water to form a wash solution.

2. (Original) The method of claim 1, wherein the wash solution remains isolated from the cleaning solution.

3. (Previously Presented) The method of claim 1, wherein the cleaning solution further comprises a surfactant selected from the group consisting of glycol ethers, carboxylic acids, amines, sulfonamides, fluoroalkylsulfonamides and derivatives thereof.

4. (Previously Presented) The method of claim 3, wherein the cleaning solution has a surfactant concentration within a range from about 1 ppm to about 100 ppm.

5. (Previously Presented) The method of claim 1, wherein the residue is selected from the group consisting of resist, polymeric, silicon, silicon oxide, aluminum, aluminum oxide, particulates of surface matter, and particulates of substrate matter.

6-8. (Cancelled)

9. (Previously Presented) The method of claim 1, wherein the cleaning solution is heated to a temperature within a range from about 15°C to about 80°C.

10. (Previously Presented) The method of claim 9, wherein the time period is less than about 2 minutes.

11. (Original) The method of claim 1, wherein the substrate surface comprises a material selected from the group consisting of aluminum, copper, tungsten, titanium, tantalum, titanium nitride, tantalum nitride, tungsten nitride and combinations thereof.

12. (Original) The method of claim 11, wherein the residue comprises a resist and the substrate surface comprises aluminum.

13. (Original) The method of claim 1, wherein the cleaning process includes sonication.

14. (Previously Presented) A method for cleaning a residue from a substrate surface, comprising:

combining an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight, with a hydrogen peroxide solution at a predetermined weight ratio of about 1 to about 20 to form an intermediate solution at a predetermined temperature of about 3°C or less higher than temperatures of the aqueous solution and the hydrogen peroxide solution,

diluting the intermediate solution with water to form a cleaning solution;

exposing the substrate surface to an aliquot of the cleaning solution, wherein the cleaning solution comprises:

hydrogen peroxide at a concentration within a range from about 1% to about 15% by weight;

sulfuric acid at a concentration within a range from about 1% to about 10% by weight; and

hydrogen fluoride at a concentration within a range from about 10 ppm to about 1,000 ppm; and

rinsing the substrate surface with water to remove a residue and the aliquot of the cleaning solution.

15. (Cancelled)

16. (Cancelled)

17. (Previously Presented) The method of claim 16, wherein the aqueous solution further comprises a surfactant.

18. (Previously Presented) The method of claim 17, wherein the surfactant is selected from the group consisting of glycol ethers, carboxylic acids, amines, sulfonamides, fluoroalkylsulfonamides and derivatives thereof.

19. (Previously Presented) The method of claim 18, wherein the cleaning solution has a surfactant concentration within a range from about 1 ppm to about 100 ppm.

20. (Previously Presented) The method of claim 14, wherein the residue is selected from the group consisting of resist, polymeric, silicon, silicon oxide, aluminum, aluminum oxide, particulates of surface matter, and particulates of substrate matter.

21-23. (Cancelled)

24. (Previously Presented) The method of claim 14, wherein the cleaning solution is heated to a temperature within a range from about 15°C to about 80°C.

25. (Previously Presented) The method of claim 24, wherein the substrate surface is exposed to the aliquot of cleaning solution in a single pass that lasts less than about 2 minutes.

26. (Original) The method of claim 14, wherein the substrate surface comprises a material selected from the group consisting of aluminum, copper, tungsten, titanium, tantalum, titanium nitride, tantalum nitride, tungsten nitride and combinations thereof.

27. (Original) The method of claim 26, wherein the residue comprises a resist and the substrate surface comprises aluminum.

28. (Original) The method of claim 14, wherein the cleaning process includes sonication.

29. (Previously Presented) A method for mixing and delivering a cleaning solution to remove a residue from a substrate surface, comprising:
providing an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight;
combining the aqueous solution and a hydrogen peroxide solution to form an intermediate solution at a predetermined temperature of about 3°C or less higher than temperatures of the aqueous solution and the hydrogen peroxide solution;
diluting the intermediate solution with water to form a cleaning solution, wherein the cleaning solution comprises:
hydrogen peroxide at a concentration within a range from about 1% to about 15% by weight;
sulfuric acid at a concentration within a range from about 1% to about 10% by weight;

hydrogen fluoride at a concentration within a range from about 10 ppm to about 1,000 ppm; and

 a surfactant at a concentration of about 1,000 ppm or less;
 delivering the cleaning solution to a substrate surface;
 removing at least a portion of a residue from the substrate surface; and
 rinsing the substrate surface to remove the cleaning solution.

30. (Previously Presented) The method of claim 29, wherein the residue is selected from the group consisting of resist, polymeric, silicon, silicon oxide, aluminum, aluminum oxide, particulates of surface matter, and particulates of substrate matter.

31-33. (Cancelled)

34. (Previously Presented) The method of claim 30, wherein the cleaning solution is heated to a temperature within a range from about 15°C to about 80°C.

35. (Original) The method of claim 34, wherein the substrate surface comprises a material selected from the group consisting of aluminum, copper, tungsten, titanium, tantalum, titanium nitride, tantalum nitride, tungsten nitride and combinations thereof.

36. (Original) The method of claim 35, wherein a sonication process is used in the cleaning solution.

37. (Previously Presented) The method of claim 36, wherein the cleaning solution is delivered to the substrate surface in a single pass that lasts less than about 2 minutes.

38. (Previously Presented) The method of claim 1, wherein the aqueous solution and the hydrogen peroxide solution are combined at a predetermined weight ratio of about 1 to about 20.

39. (Cancelled)

40. (Previously Presented) The method of claim 1, wherein the aqueous solution contains by weight about 67% of sulfuric acid, about 0.4% of hydrogen fluoride and about 0.1% of a surfactant and the hydrogen peroxide solution contains by weight about 8% of hydrogen peroxide.

41. (Cancelled)

42. (Previously Presented) The method of claim 14, wherein the aqueous solution contains by weight about 67% of sulfuric acid, about 0.4% of hydrogen fluoride and about 0.1% of a surfactant and the hydrogen peroxide solution contains by weight about 8% of hydrogen peroxide.

43. (Previously Presented) The method of claim 29, wherein the aqueous solution and the hydrogen peroxide solution are combined at a predetermined weight ratio of about 1 to about 20.

44. (Cancelled)

45. (Previously Presented) The method of claim 29, wherein the aqueous solution contains by weight about 67% of sulfuric acid, about 0.4% of hydrogen fluoride and about 0.1% of a surfactant and the hydrogen peroxide solution contains by weight about 8% of hydrogen peroxide.